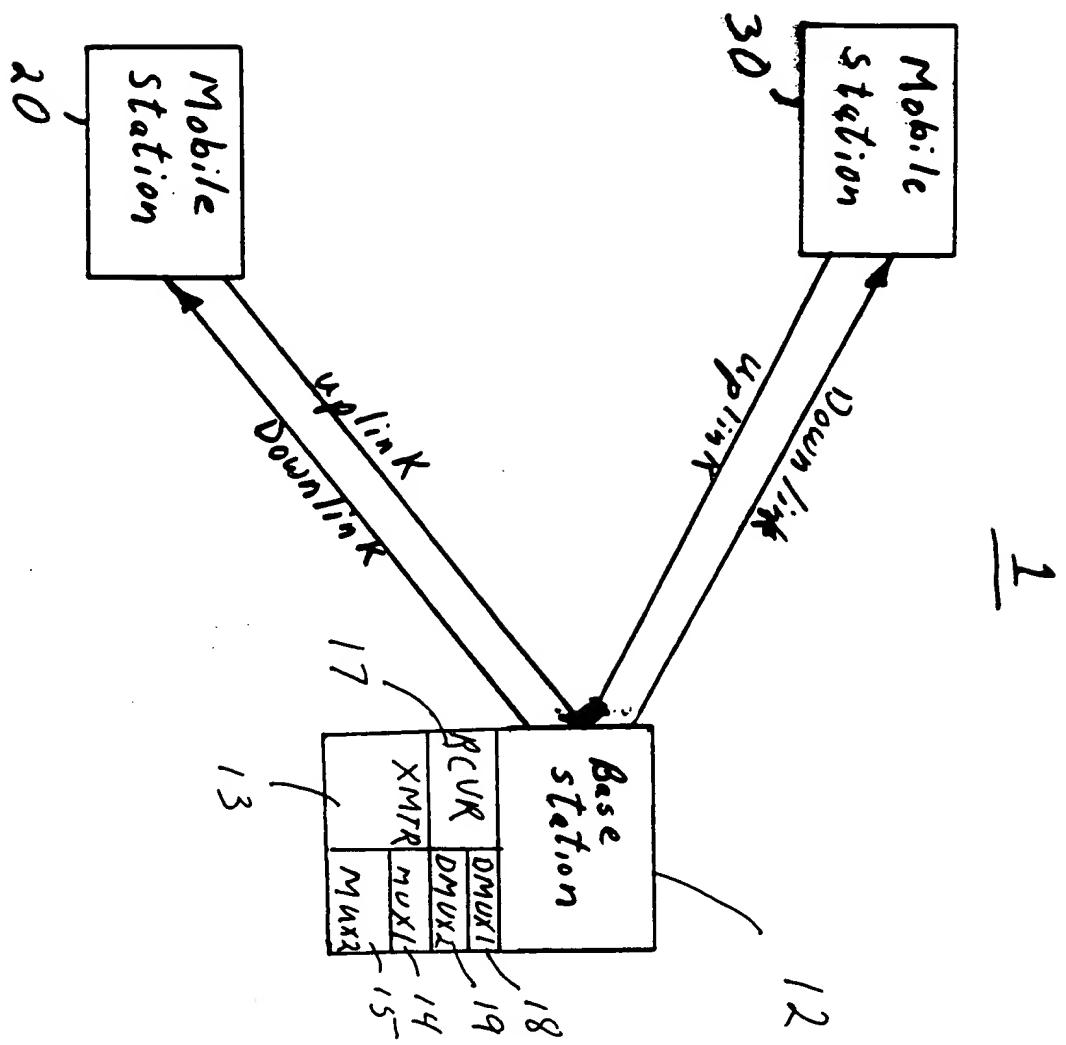
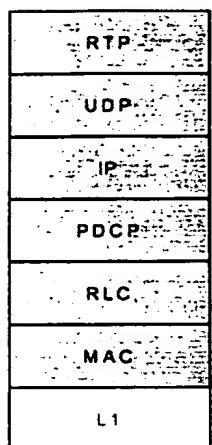


Fig. 1

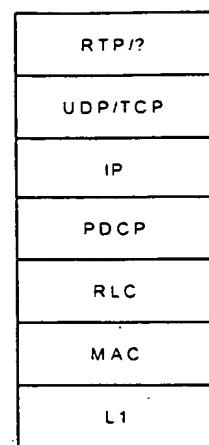


Optimized Speech



(a)

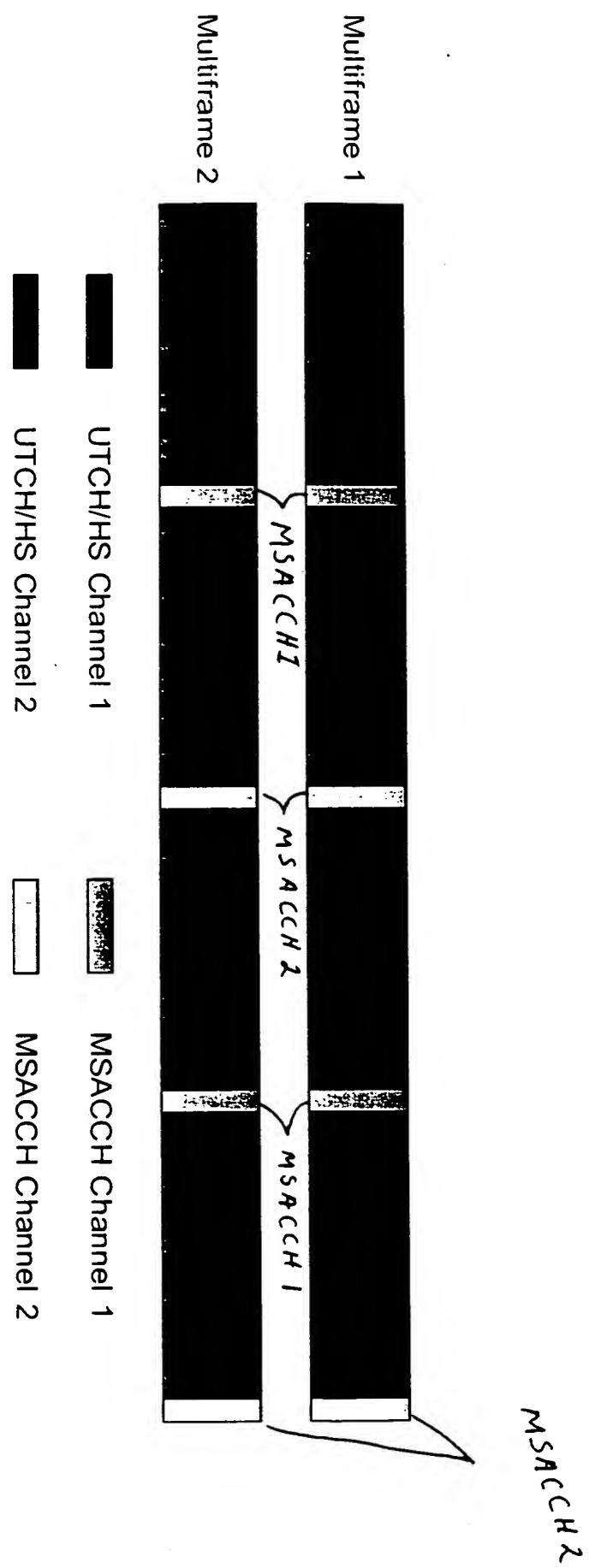
RT Data and nRT Data



(b)

Note: Shaded Parts are eliminated from the overhead of speech frames

FIG. 2



For data traffic channels, there is no MSACCH, and all allocated bursts in the time slot are available for traffic.

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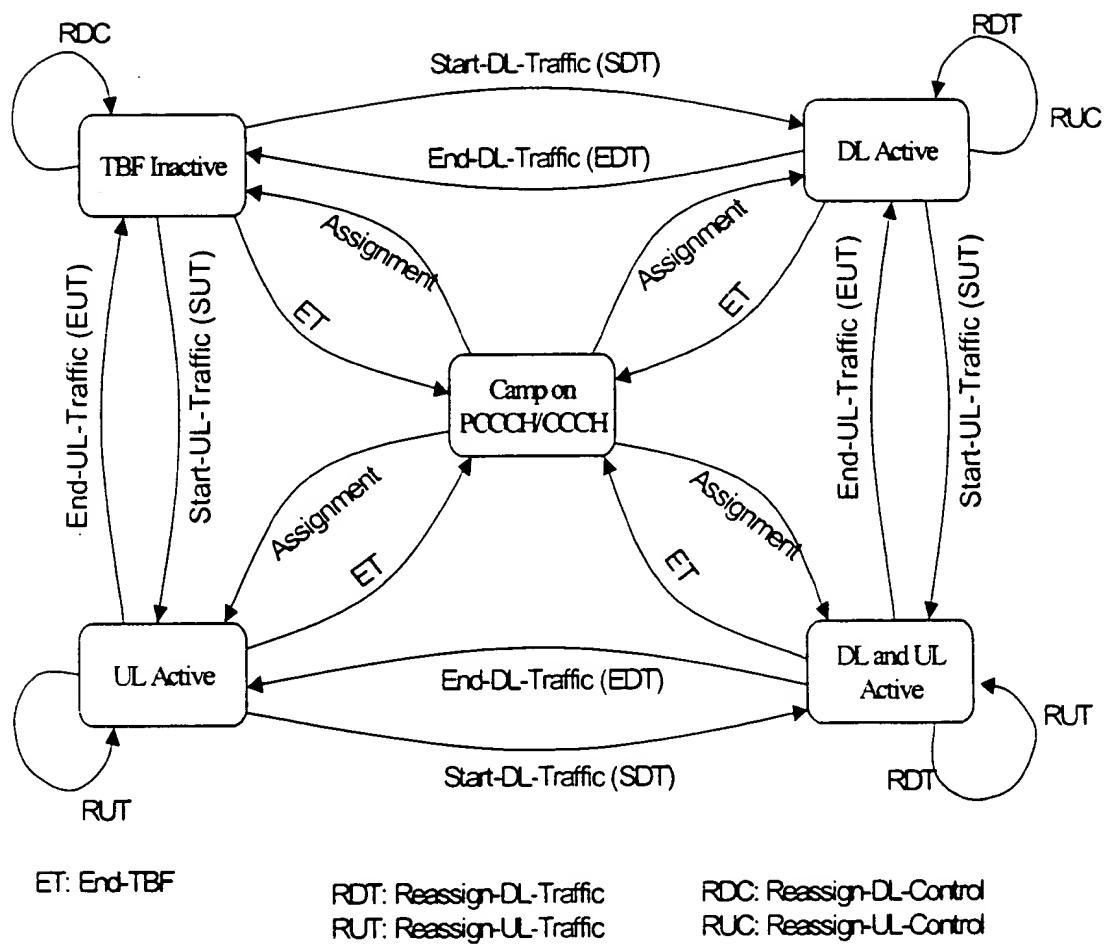


FIG. 4

RT TBF State	Traffic Activity		TCH Channel Assignment		Control Channel Assignment	
	UL	DL	UL	DL	UL	DL
TBF Inactive	idle	idle			FRACH FACKCH UPRCH UBMCH	FASSCH DPRCH DBMCH
UL Active	active	idle	UTCH/ (B)FACCH / MSACCH		FRACH FACKCH UBMCH	FASSCH DPRCH DBMCH
DL Active	idle	active		DTCH/ (B)FACCH / MSACCH	FRACH FACKCH UPRCH UBMCH	FASSCH DBMCH
UL + DL Active	active	active	UTCH/ (B)FACCH / MSACCH	DTCH/ (B)FACCH / MSACCH	FRACH FACKCH UBMCH	FASSCH DBMCH

FIG. 5

Procedures	RT TBF State			
	Inactive	UL Active	DL Active	DL+UL Active
Reassign DL Control (RDC)	x	x		
Reassign UL Control (RUC)	x		x	
Start DL Traffic (SDT)	x	x		
End DL Traffic (EDT)			x	x
Reassign DL Traffic (RDT)			x	x
Start UL Traffic (SUT)	x		x	
End UL Traffic (EUT)		x		x
Reassign UL Traffic (RUT)		x		x
End TBF (ET)	x	x	x	x
Start new TBF (ST)	x	x	x	x

FIG. 6

Message	Channel During Uplink Traffic	Channel with no Uplink Traffic
Access Request	BFACCH	FRACH
Acknowledge to Assignment	BFACCH	FACKCH
AMR Mode Request	UTCH	UPRCH
SID Update	N/A	UPRCH
Neighbor Measurement Report	MSACCH	UPRCH
RLC Signaling	UTCH	UBMCH
End TBF Request	BFACCH	FRACH

FIG. 7

Message	Channel During DL Traffic	Channel with no DL Traffic
Assignment (all)	BFACCH	FASSCH
AMR Mode Command	DTCH	DPRCH
SID Update	N/A	DPRCH
Handover Directives	FACCH	DBMCH
RLC Signaling	DTCH	DBMCH
Timing Advance	MSACCH	DPRCH
Power Control	MSACCH	DPRCH
End TBF Command	BFACCH	FASSCH

FIG. 8

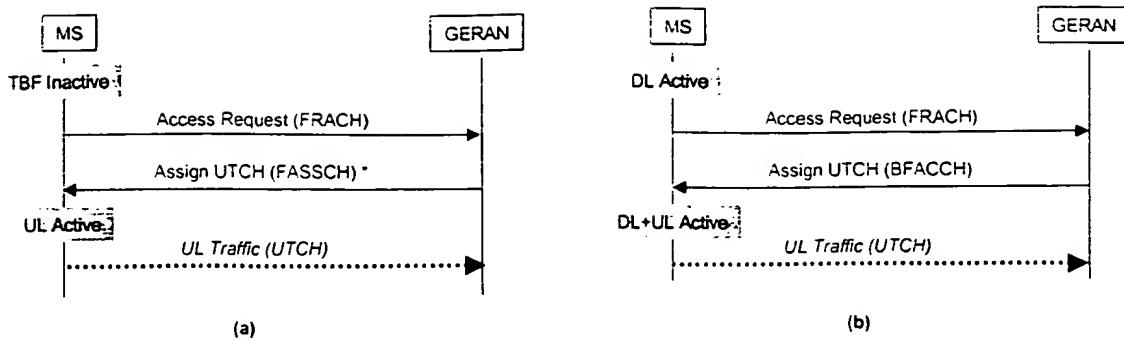
Downlink Burst Message	Information Elements
Assign UTCH	ARI, DMT, TBFI, CID, CTS, PH, SD
Deferred Assign UTCH	ARI, DMT, TBFI, RRBPs, delay
Assign DTCH	ARI, DMT, TBFI, RRBPs, CID, CTS, PH, SD
Assign UPRCH	ARI, DMT, RRBPs, CID, CTS, OFF
Assign DPRCH	ARI, DMT, RRBPs, CID, CTS, OFF
Assign FRACH	ARI, DMT, RRBPs, CID, CTS, PH
Assign FACKCH	ARI, DMT, RRBPs, CID, CTS, PH
Assign FASSCH	ARI, DMT, RRBPs, CID, CTS, PH
End TBF Command	ARI, DMT, TBFI, RRBPs, reason

FIG. 9

Uplink Burst Message	Information Elements
Access Request	ARI, UMT, TBFI
Acknowledge UTCH	ARI, UMT, TBFI
Acknowledge DTCH	ARI, UMT, TBFI
Acknowledge UPRCH	ARI, UMT, TBFI
Acknowledge DPRCH	ARI, UMT, TBFI
Acknowledge FRACH	ARI, UMT, TBFI
Acknowledge FACKCH	ARI, UMT, TBFI
Acknowledge FASSCH	ARI, UMT, TBFI
Acknowledge End TBF	ARI, UMT, TBFI
End TBF Request	ARI, UMT, TBFI, reason

FIG. 10

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• Variation: Deferred Assign UT

FIG. 11

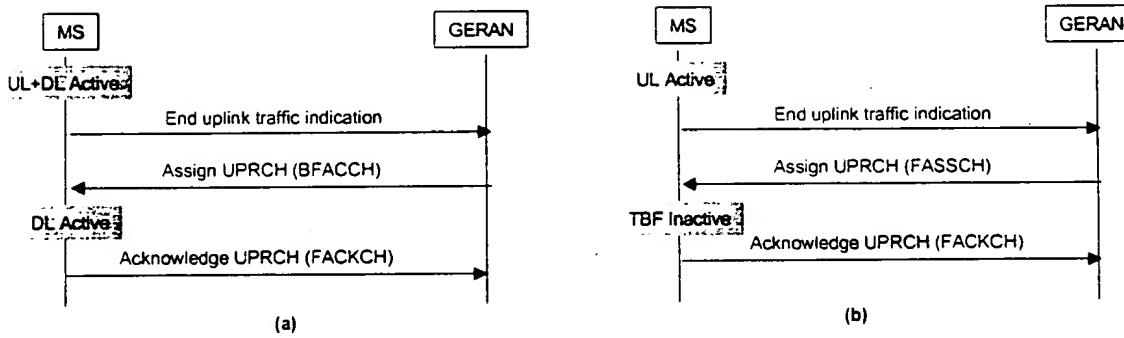


FIG 12

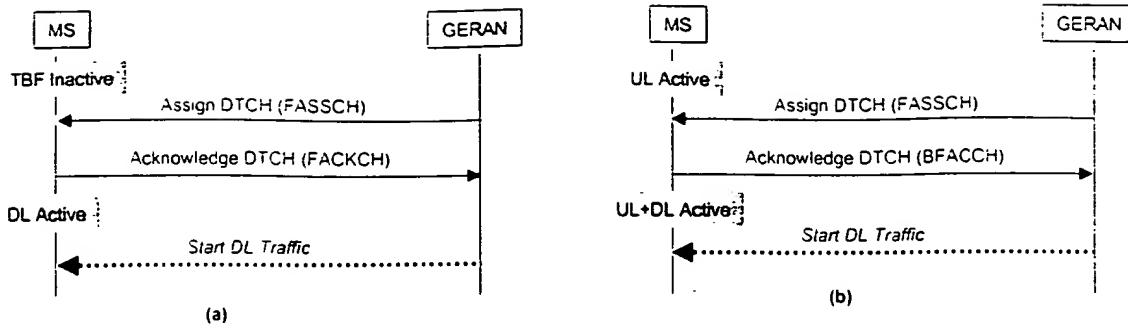


FIG. 13

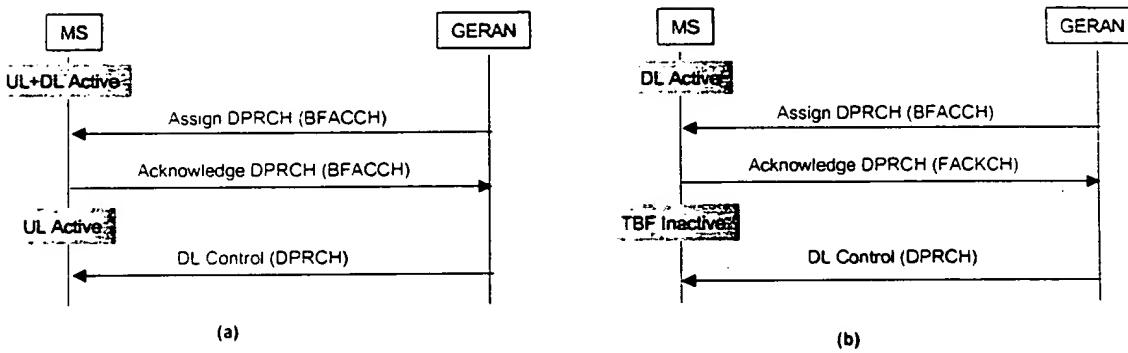


FIG. 14

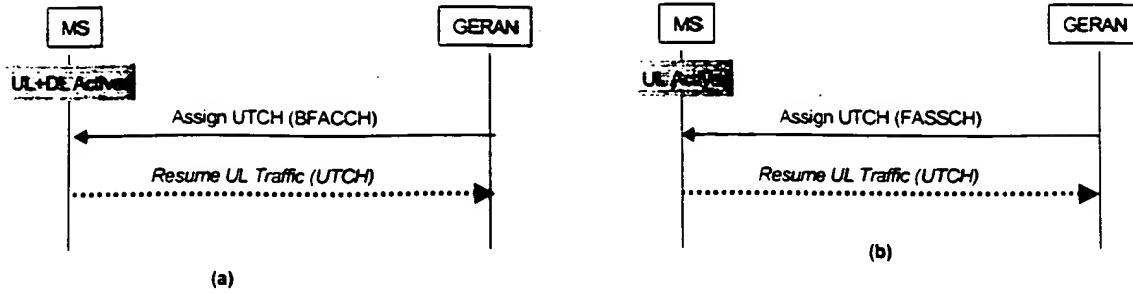


FIG. 15

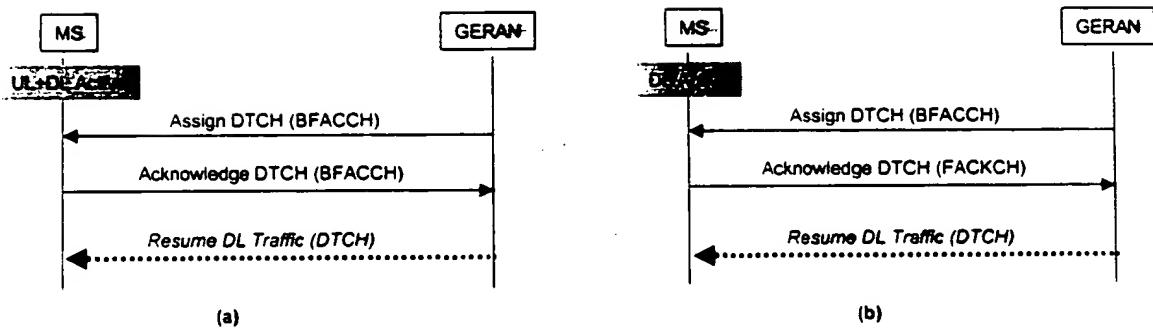


FIG. 16

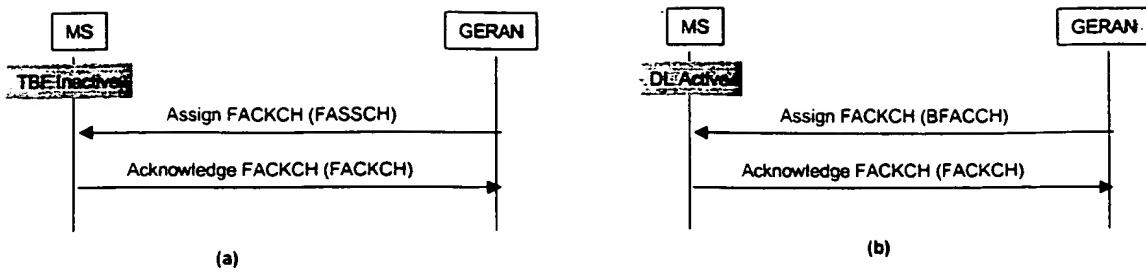


FIG. 17

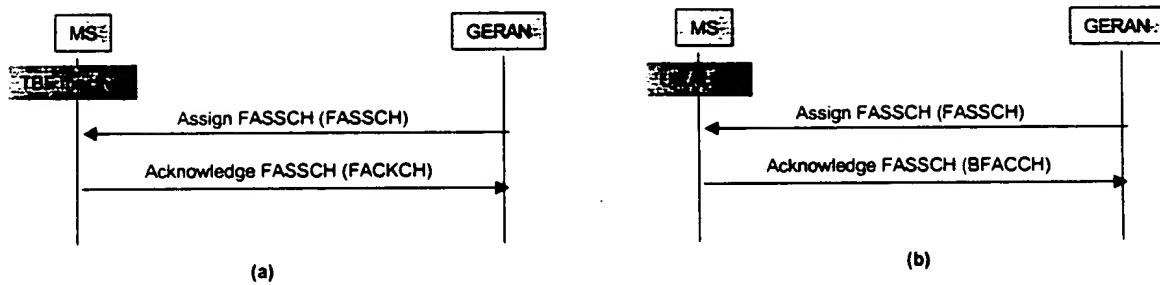
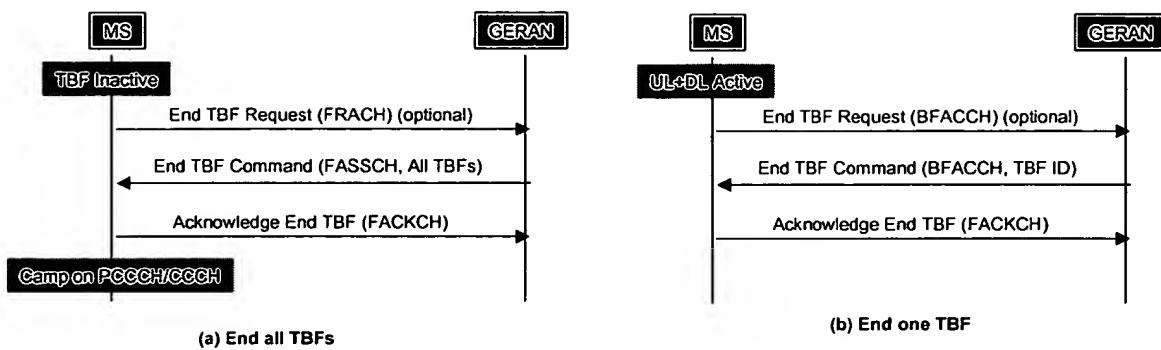


FIG. 18

FIG 19



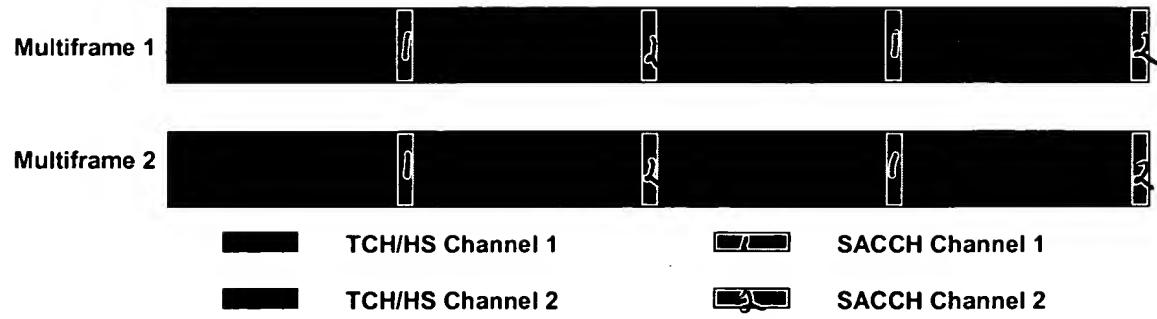


FIG. 20

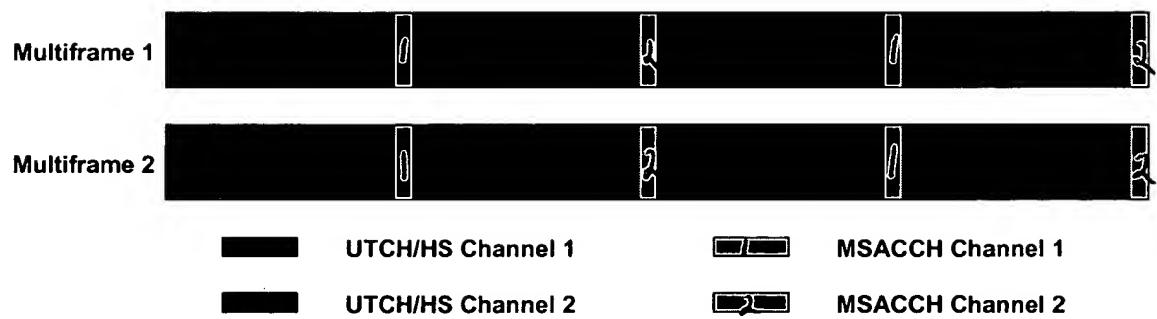


FIG. 21

D(0, even)	D(1, even)	D(2, even)	D(3, even)	D(4, even)	D(5, even)	D(6, even)	D(7, even)
------------	------------	------------	------------	------------	------------	------------	------------

D(0, odd)	D(1, odd)	D(2, odd)	D(3, odd)	D(4, odd)	D(5, odd)	D(6, odd)	D(7, odd)
-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

D(i, even) Downlink time slot i, bursts 0246... D(i, odd) Downlink time slot i, bursts 1357...

█ Resources to which a downlink talkspurt may be allocated

█ Overlap with transmissions during odd bursts on uplink time slot 5

FIG. 22

D(0, 0123)	D(1, 0123)	D(2, 0123)	D(3, 0123)	D(4, 0123)	D(5, 0123)	D(6, 0123)	D(7, 0123)
------------	------------	------------	------------	------------	------------	------------	------------

D(0, 4567)	D(1, 4567)	D(2, 4567)	D(3, 4567)	D(4, 4567)	D(5, 4567)	D(6, 4567)	D(7, 4567)
------------	------------	------------	------------	------------	------------	------------	------------

D(i, 0123) Downlink time slot i, bursts 0123... D(i, 4567) Downlink time slot i, bursts 4567...

█ Resources to which a downlink talkspurt may be allocated

█ Transmissions during burst 7 on uplink time slot 5 overlap with burst 0 on downlink time slot 0

FIG. 23

D(0, even)	D(1, even)	D(2, even)	D(3, even)	D(4, even)	D(5, even)	D(6, even)	D(7, even)
------------	------------	------------	------------	------------	------------	------------	------------

D(0, odd)	D(1, odd)	D(2, odd)	D(3, odd)	D(4, odd)	D(5, odd)	D(6, odd)	D(7, odd)
-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

D(i, even) Downlink time slot i, bursts 0246... D(i, odd) Downlink time slot i, bursts 1357

█ Resources to which a downlink talkspurt may be allocated

█ Overlap with transmissions during odd bursts on uplink time slot 5

FIG. 24

D(0, 0123)	D(1, 0123)	D(2, 0123)	D(3, 0123)	D(4, 0123)	D(5, 0123)	D(6, 0123)	D(7, 0123)
D(0, 4567)	D(1, 4567)	D(2, 4567)	D(3, 4567)	D(4, 4567)	D(5, 4567)	D(6, 4567)	D(7, 4567)

D(i, 0123) Downlink time slot i, bursts 0123... D(i, 4567) Downlink time slot i, bursts 4567...

- Resources to which a downlink talkspurt may be allocated
- Transmissions during burst 7 on uplink time slot 5 overlap with burst 0 on downlink time slot 0

FIG. 25

Time slots

Frames	D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)
	D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)
D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)	
D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)	
D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)	
D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)	
D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)	
D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)	
D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)	
D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)	
D(0, even) U(5, odd)	D(1, even) U(6, odd)	D(2, even) U(7, odd)	D(3, even) U(0, even)	D(4, even) U(1, even)	D(5, even) U(2, even)	D(6, even) U(3, even)	D(7, even) U(4, even)	
D(0, odd) U(5, even)	D(1, odd) U(6, even)	D(2, odd) U(7, even)	D(3, odd) U(0, odd)	D(4, odd) U(1, odd)	D(5, odd) U(2, odd)	D(6, odd) U(3, odd)	D(7, odd) U(4, odd)	

D(i, j) Downlink time slot i, burst j U(i, j) Uplink time slot i, burst j

- Bursts during which uplink speech transmission occurs
- Bursts on which a downlink talkspurt may start

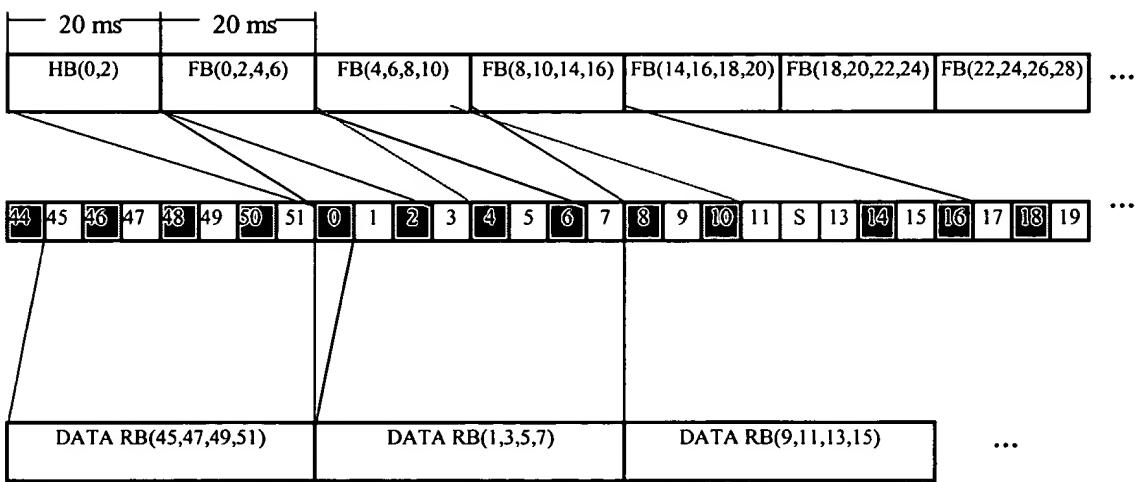
FIG. 26

		Time slots							
		D(0, 0) U(5, 7)	D(1, 0) U(6, 7)	D(2, 0) U(7, 7)	D(3, 0) U(0, 0)	D(4, 0) U(1, 0)	D(5, 0) U(2, 0)	D(6, 0) U(3, 0)	D(7, 0) U(4, 0)
Frames	D(0, 1) U(5, 0)	D(1, 1) U(6, 0)	D(2, 1) U(7, 0)	D(3, 1) U(0, 1)	D(4, 1) U(1, 1)	D(5, 1) U(2, 1)	D(6, 1) U(3, 1)	D(7, 1) U(4, 1)	
	D(0, 2) U(5, 1)	D(1, 2) U(6, 1)	D(2, 2) U(7, 1)	D(3, 2) U(0, 2)	D(4, 2) U(1, 2)	D(5, 2) U(2, 2)	D(6, 2) U(3, 2)	D(7, 2) U(4, 2)	
	D(0, 3) U(5, 2)	D(1, 3) U(6, 2)	D(2, 3) U(7, 2)	D(3, 3) U(0, 3)	D(4, 3) U(1, 3)	D(5, 3) U(2, 3)	D(6, 3) U(3, 3)	D(7, 3) U(4, 3)	
	D(0, 4) U(5, 3)	D(1, 4) U(6, 3)	D(2, 4) U(7, 3)	D(3, 4) U(0, 4)	D(4, 4) U(1, 4)	D(5, 4) U(2, 4)	D(6, 4) U(3, 4)	D(7, 4) U(4, 4)	
	D(0, 5) U(5, 4)	D(1, 5) U(6, 4)	D(2, 5) U(7, 4)	D(3, 5) U(0, 5)	D(4, 5) U(1, 5)	D(5, 5) U(2, 5)	D(6, 5) U(3, 5)	D(7, 5) U(4, 5)	
	D(0, 6) U(5, 5)	D(1, 6) U(6, 5)	D(2, 6) U(7, 5)	D(3, 6) U(0, 6)	D(4, 6) U(1, 6)	D(5, 6) U(2, 6)	D(6, 6) U(3, 6)	D(7, 6) U(4, 6)	
	D(0, 7) U(5, 6)	D(1, 7) U(6, 6)	D(2, 7) U(7, 6)	D(3, 7) U(0, 7)	D(4, 7) U(1, 7)	D(5, 7) U(2, 7)	D(6, 7) U(3, 7)	D(7, 7) U(4, 7)	
	D(0, 0) U(5, 7)	D(1, 0) U(6, 7)	D(2, 0) U(7, 7)	D(3, 0) U(0, 0)	D(4, 0) U(1, 0)	D(5, 0) U(2, 0)	D(6, 0) U(3, 0)	D(7, 0) U(4, 0)	
	D(0, 1) U(5, 0)	D(1, 1) U(6, 0)	D(2, 1) U(7, 0)	D(3, 1) U(0, 1)	D(4, 1) U(1, 1)	D(5, 1) U(2, 1)	D(6, 1) U(3, 1)	D(7, 1) U(4, 1)	

D(i, j) Downlink time slot i, burst j U(i, j) Uplink time slot i, burst j

 Bursts during which uplink speech transmission occurs
 Bursts on which a downlink talkspurt may start

FIG. 27



HB(i,j) Half Block for speech coded and interleaved over bursts i and j
FB(i,j,k,l) Full Block for speech coded and interleaved over bursts i, j, k and l
S SACCH burst for half rate speech traffic channel
RB Radio Block

FIG. 28

Channel	Interleaving	Vocoder Rate	Coding Rate	C/I (dB) for 1% FER	
				iFH	no FH
TU3	0246/1357	7.4 EEP	0.41	13.15	18.8
	0123/4567	7.4 EEP	0.41	13.1	19.8
BU100	0246/1357	7.4 EEP	0.41	13.5	13.1
	0123/4567	7.4 EEP	0.41	13.3	13.5
HT100	0246/1357	7.4 EEP	0.41	14.7	15.5
	0123/4567	7.4 EEP	0.41	14.9	16.3

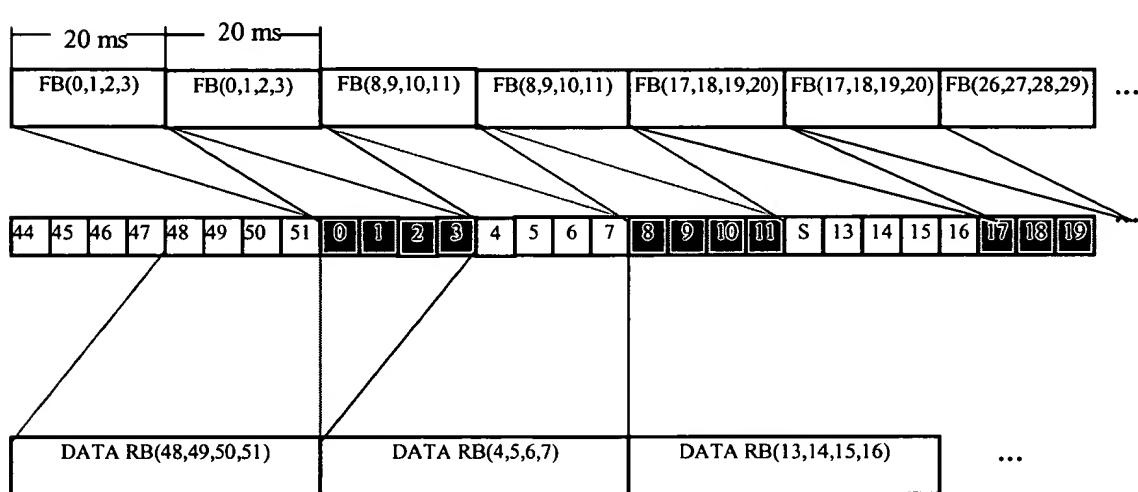
Table: Performance of the two interleaving schemes with QPSK modulation.

FIG. 31

Speech Frame Number	0246/1357 Interleaving		0123/4567 Interleaving	
	Arrival at Receiver (ms)	Play Out (ms)	Arrival at Receiver (ms)	Play Out (ms)
0	9.23	14	13.845	14
1	27.69	34	13.845	34
2	46.15	54	50.765	54
3	73.84	74	50.765	74
4	92.3	94	92.3	94
5	110.76	114	92.3	114
6	129.22	134	133.835	134

Table: Speech frame arrivals and play out instants with different interleaving approaches; the end of burst 0 occurs at 0.0 ms.

FIG. 29



FB(i,j,k,l) Full Block for speech interleaved over bursts i, j, k and l

S SACCH burst for half rate speech traffic channel

RB Radio Block

FIG. 30